

CLAIMS

What we claim is:

- 1 1. An optoelectronic device, comprising:
 - 2 a first ohmic contact on a first surface of a silicon wafer and a second
 - 3 ohmic contact on a first area of a second surface of the silicon wafer;
 - 4 an aluminum nitride layer deposited on a second area of the second
 - 5 surface of the silicon wafer, a portion of the aluminum nitride having diffused into the silicon
 - 6 layer to form a p-n junction in the silicon wafer;
 - 7 a first layer of gallium nitride deposited on the aluminum nitride layer;
 - 8 a layer of indium gallium nitride deposited on the first layer of gallium
 - 9 nitride, the layer of indium gallium nitride having a top surface;
 - 10 a second layer of gallium nitride deposited on a first area of the top surface
 - 11 of the indium gallium nitride layer and an ohmic contact on the second layer of gallium nitride;
 - 12 and
 - 13 a second ohmic contact on a second area of the top surface of the layer of
 - 14 indium gallium nitride.
- 1 2. The device of claim 1 wherein the thickness of the first and the second gallium
- 2 nitride layers and the indium gallium nitride layer is in the range from about 0.5 to about 1
- 3 micrometers.

1 3. The device of claim 1 further comprising a multi-quantum well heterostructure
2 between the first layer of gallium nitride and the silicon wafer.

1 4. An optoelectronic device, comprising:
2 a silicon substrate;
3 a layer of semiconductor deposited on the silicon substrate;
4 an ohmic contact with a first area of the layer of semiconductor;
5 a metal-insulator layer on a second area of the layer of semiconductor to
6 form an M-I-S Schottky contact;
7 a layer of a transparent electrode on the metal-insulator layer to form a
8 metal-insulator-semiconductor Schottky contact on the second area of the layer of
9 semiconductor, the layer of transparent electrode having an ohmic contact thereon;
10 a multi-quantum well heterostructure on a third area of the layer of
11 semiconductor;
12 a gallium nitride layer deposited on the multi-quantum well
13 heterostructure and having an ohmic contact; and
14 a layer of a transparent electrode deposited on a part of the layer of
15 gallium nitride, the layer of transparent electrode having an ohmic contact.

1 5. The device of claim 4 wherein the transparent electrode is comprised of fluorine-
2 doped tin oxide.